Amendments to the Specification:

Please replace the paragraph [0003] with the following amended paragraph:

[0003] A 3R regenerator (Reamplifying, Reshaping, Retiming) is a known example of an all-optical regenerator useful for future high-speed and high-capacity transparent optical networks. All-optical clock recovery is a major building block of the 3R all-optical regenerator because clock recovery is needed for its re-timing function. Many single channel approaches to all-optical clock recovery have been proposed and demonstrated. One single-channel clock recovery device used a fiber-optic parametric oscillator where the amplitude-modulated parametric gain for the clock signal is ~~optical~~ optically phase insensitive. Most clock recovery approaches are designed for one channel operation because for multi-channel all-optical clock recovery (MOCR), technical challenges are multiplied.

Please replace the paragraph [0030] with the following amended paragraph:

[0030] Referring to FIG. 3, the operation principle of FIG. 2 is illustrated showing gain profiles where $\lambda_{s1}...\lambda_{sn}$ are respectively the wavelengths of input channels 1 ... n. $\lambda_{s1}...\lambda_{sn}$ are the wavelengths of recovered clocks for respectively channels 1 ... n. The center wavelength of the i_{th} CFBG (or the i_{th} channel clock wavelength λ_{ci}) is set at one of the parametric gain peaks (λ_{ci}) of the nonlinear fiber (HNL-DSF1) 3 provided by the i_{th} input channel signal (λ_{si}). As will be discussed later, by properly designing the nonlinear fiber or properly choosing the fiber length, the gain produced by each channel signal will be separated in the wavelength domain. Therefore, the gain of each clock signal is independently modulated by the corresponding input signals. To compensate for the cavity loss, the parametric amplifier 56, consisting of a section of highly-nonlinear dispersion shifted fiber (HNL-DSF2) 33 is pumped by a high power CW light 6 on a pump input 5. When the pump light power is much larger than the power of the clock signals, the pump depletion can be neglected and the amplifier 56 works as if its gain was inhomogeneously broadened. Unlike a standard EDFA, the mode competition produced by the amplifier 56 is eliminated. When the CFBG's are properly designed, as discussed

later, each channel clock can automatically ~~adjusts~~ adjust its wavelength to allow the round-trip delay be equal to a multiple of the corresponding input signal bit period. Thus, a multi-channel actively mode-locked ring laser is formed through spatial modulation, where the signal gain of each resonant (clock) channel is strongly spatially modulated by only corresponding incoming channel data, and the clock signal is independently extracted from each incoming data stream.

Please replace the paragraph [0041] with the following amended paragraph:

[0041] Referring to FIG. 4, the second Raman amplifier configuration is shown. The parametric amplifier 56 of FIG. 2 is simultaneously used as a Raman amplifier by adding the two Raman pump sources, coupled by two separate couplers, such as wavelength division multiplexers 41 and 42, and the gain medium 3 which could be a holey fiber, a photonic band gap fiber, a Raman fiber, or any other type of highly nonlinear dispersion shifted fiber. As shown in FIG. 5, when the wavelength of the Raman pump light is properly chosen, the Raman gain bandwidth can fully cover the clock signals of all ~~channel~~ channels. So, the same nonlinear fiber (HNL-DSF) or gain medium 3 serves as the nonlinear medium for both parametric gain modulation and Raman amplification. In general, the CW pump light power is much larger than the power of the clock signals, and therefore the pump depletion can be neglected. In addition, the Raman amplifier gain is at least in part inhomogeneously broadened. Therefore, unlike when using a standard EDFA, the mode competition produced by the amplifier is eliminated. All other design issues are the same as discussed with FIGS. 2 and 3.

Please replace the paragraph [0044] with the following amended paragraph:

[0044] Because the phase insensitive design employs a number of chirped fiber Bragg gratings (CFBG's), such as gratings 25 and 31 in the laser cavity to automatically compensate environmental cavity length change by the small shift of the lasing wavelength, passive locking of the output pulse repetition rate to any input clock frequency is enabled. Since the parametric gain is ~~optical~~ optically phase insensitive, this

phase insensitive design is also free from the noise caused by a random signal phase variation.

Please replace the paragraph [0045] with the following amended paragraph:

[0045] Referring to FIG. 6, the typical dispersion curve of the dispersion shifted highly nonlinear fiber 3 is depicted. The highly nonlinear dispersion shifted fiber 3 is designed to have a zero dispersion wavelength outside the C band (1535 nm-1570 nm) and preferably on the shorter wavelength side. The optical effect used with the fiber 3 is the four-wave-mixing based harmonic mode locking of a parametric laser in a ring cavity configuration of FIGS. 1, 2, or 4. The parametric gain manifests itself when a pump and a signal are present at the input of the fiber and in particular on the input of a dispersion shifted fiber 3. Regardless of phase sensitive or phase insensitive, the efficiency of the parametric gain is related to the phase matching conditions between the signal and the pump and to the nonlinear coefficient of the fiber. The parametric gain bandwidth depends on the interplay between the phase mismatch and the nonlinear effect induced phase shift and is narrower when the pump wavelength is far from the zero dispersion wavelength. The peaks of the gain will be observed at wavelengths where group velocity dispersion phase shift is compensated by the nonlinear phase shift i.e. $\Delta k = -2\gamma P$ where γ is the nonlinear coefficient, P is the pump power and Δk is the group velocity dispersion phase mismatch. At the same time, in linear chromatic dispersion approximation, $\Delta k \propto D_\lambda \left(\lambda_p - \lambda_0\right)\left(\lambda_p - \lambda_s\right)^2$, where D_λ is the slope of dispersion at zero dispersion wavelength, λ_p is the pump wavelength, λ_s is the signal wavelength and λ_0 is the zero dispersion wavelength. The bandwidth of the parametric gain for different pump positions is represented on FIG. 7. Far from the zero-dispersion wavelength, the parametric gain has a narrow bandwidth. This fact is used in the phase insensitive design to construct a multi-wavelength clock recovery system for several channels. Each ~~cannel~~ <u>channel</u> is used as a pump for a narrow bandwidth phase insensitive parametric process. The narrow gain from the Bragg gratings 25 or 31 insures that no significant cross talk between the extracted channels will be observed.